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# Lesson Plan: The Marvelous Motion & Machine Mission

### Materials Needed:

- A small, heavy object (like a can of soup or a large book)
- A ruler or sturdy paint stirrer (for a lever)
- A marker, a small block, or a roll of tape (for a fulcrum)
- A large hardcover book or a small cutting board (for an inclined plane)
- A toy car
- A doorstop or a plastic knife (for a wedge)
- A jar with a screw-on lid
- An empty spool of thread, a pencil, and some string (to make a simple pulley)
- A small object to lift with the pulley (like a small toy or a binder clip)
- Dominoes, small wooden blocks, or LEGO bricks
- A marble or a small ball
- Cardboard tubes (from paper towels or toilet paper)
- Tape
- Optional: A small bell to be the final target

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## Lesson Details

**Subject:** Science (Physics & Engineering)

**Grade Level:** 1st - 2nd Grade (Age 7)

**Time Allotment:** 60-75 minutes (flexible)

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### 1. Learning Objectives

By the end of this lesson, the student will be able to:

- Identify and name at least three different simple machines (lever, inclined plane, wheel and axle, wedge, screw, pulley).
- Demonstrate how an inclined plane and a lever can make work (moving an object) easier.
- Apply their knowledge by designing and building a simple chain-reaction machine that uses at least two simple machines to complete a task.

### 2. Alignment with Standards

This lesson aligns with the Next Generation Science Standards (NGSS) for K-2 Engineering Design:

- **K-2-ETS1-1:** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- **K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

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3. Instructional Strategies & Lesson Activities

Part 1: The Mission Briefing (5-10 minutes - Engagement)

Start with a question: "Have you ever wanted to move something heavy without picking it up? Or knock something over that's all the way across the table? Today, your mission is to become a master of motion! We're going to explore secret tools called 'simple machines' that make pushing, pulling, and lifting super easy."

Show the student the can of soup (or other heavy object). Ask, "How many ways can we move this from here to there?" Let them suggest ideas.

Part 2: Machine Training Stations (20-25 minutes - Exploration)

Set up different "stations" to explore each machine. Spend a few minutes at each one.

- **Station 1: The Lever Lift.**
  - **Setup:** Place the marker (fulcrum) on the table. Place the ruler (lever) over it. Put the heavy can on one end of the ruler.
  - **Action:** "Try to lift the can by just pushing on the end of the ruler. Is it easy or hard? What happens if you move the marker closer to the can?" The student will discover it becomes much easier. This is a lever!
- **Station 2: The Inclined Plane Ramp.**
  - **Setup:** Prop one end of the large book or cutting board up to create a ramp (inclined plane).
  - **Action:** "Try lifting the toy car straight up onto the table. Now, try rolling it up your ramp. Which way was easier?" This is an inclined plane!
- **Station 3: Wheel & Axle Racers.**
  - **Setup:** Use the toy car.
  - **Action:** "Push the toy car. Now, try pushing a block without wheels. Which one moves better?" Explain that wheels and axles help things roll and reduce friction.
- **Station 4: The Wedge Split.**
  - **Setup:** Use a doorstop or a plastic knife and a piece of play-doh (if available) or just demonstrate.
  - **Action:** "A wedge is like two ramps put together. It helps us push things apart!" Show how a doorstop holds a door open or how a plastic knife can split play-doh.

Part 3: The Marvelous Machine Challenge (25-30 minutes - Application & Creativity)

The Challenge: "Your final mission is to build a 'Marvelous Machine'—a fun chain reaction! Your machine must use at least **two** different simple machines to complete a goal."

Example Goal: Knock over a single domino or ring a small bell.

Instructions:

1. **Brainstorm:** Talk about how the machines could connect. "Maybe we can roll a car (wheel and axle) down a ramp (inclined plane) to hit something?"
2. **Build:** Using the materials (cardboard tubes, tape, dominoes, car, ramp, etc.), let the student build their machine. Encourage trial and error. This is the heart of engineering!
3. **Test and Revise:** Let them test their machine. If it doesn't work, ask questions like, "What part didn't work? Is the ramp steep enough? Is the car heavy enough?" Help them adjust their design.
4. **Demonstrate!** Once they are successful, have them present their Marvelous Machine and explain how it works.

4. Differentiation and Inclusivity

- **For Extra Support:** Work alongside the student to build a pre-designed machine. Start with a very simple goal, like rolling a marble down a ramp to hit one domino. Give plenty of verbal cues and help physically manipulate the materials.
- **For an Advanced Challenge:** Challenge the student to incorporate three or more simple machines. Ask them to first draw a plan or "blueprint" of their machine before building it. Have them create a longer, more complex chain reaction.

5. Assessment Methods

- **Performance Assessment:** The primary assessment is the successful creation and demonstration of their Marvelous Machine. Does it meet the goal of using at least two simple machines?
- **Verbal Explanation:** During their demonstration, ask the student to point to the simple machines they used. ("Can you show me the inclined plane? Where is the wheel and axle?")
- **Observation:** Observe the student's problem-solving process. Are they engaged? Are they trying different solutions when something fails?

6. Closure and Real-World Connection (5 minutes)

After the machine demonstration, praise their hard work and creativity.

Say, "Simple machines aren't just for our mission today; they are everywhere! Let's go on a 'Simple Machine Hunt' around the house." Walk around and find examples:

- A light switch (lever)
- A door knob (wheel and axle)
- A screw in a piece of furniture (screw)
- Stairs (inclined plane)
- A knife in the kitchen (wedge)

This reinforces that science is part of everyday life, not just a lesson.

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